

A lower bound on inspection time for complex systems with Weibull transitions

Stéphane Chrétien* and Franck Corset**

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The paper studies the expectation of the inspection time in complex aging systems. Under reasonable assumptions, this problem is equivalent to studying the expectation of the length of the shortest path in the directed degradation graph of the systems where the parameters are obtained from experts. The expectation itself being sometimes out of reach, in closed form or even through Monte Carlo simulations in the case of large systems, we study the bound of Dyer, Frieze and McDiarmid which provides an interesting upper bound in the case of exponential transition times between degradation states. On the other hand, we show that this bound does not hold for Weibull distributions. Another problem is that lower bounds are much more useful in the context of estimating inspection times before failure. Such a rigorous lower bound is presented for the case of Weibull distribution with reasonable values of the shape parameter.

*Université de Franche-Comté, UMR6623, Département Mathématiques
16 route de Gray 25000 Besançon.
email: chretien@math.univ-fcomte.fr

**LabSAD, EA 3698, Université Pierre Mendès France
BSHM, 1251 Avenue centrale BP47 38040 Grenoble Cedex 09
email: Franck.Corset@upmf-grenoble.fr